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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/750,064	12/30/2003	Alexander A. Maltsev	1020.P16742	9115

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EXAMINER	
BURD, KEVIN MICHAEL	
ART UNIT	PAPER NUMBER
2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/750,064	MALTSEV ET AL.	
	Examiner	Art Unit	
	Kevin M. Burd	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 April 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6,10-16 and 18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,10-16 and 18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

1. This office action, in response to the request for continued examination and the amendment filed 4/29/2008, is a non-final office action.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4/29/2008 has been entered.

Response to Arguments

3. Applicant's arguments filed 4/29/2008 have been fully considered but they are not persuasive. Applicant states the prior art does not disclose generating a replica of a transmitted symbol for each of a plurality of subcarriers. The examiner disagrees. Sun discloses the process stated in the previous rejection of the claims. Paragraph 0156 discloses the multiple data streams are detected and "for notation simplicity, one and only one subcarrier is considered in the following description, wherein the same procedure would be repeated for each subcarrier." The method and apparatus of the combination will operate using the same disclosed process for each of a plurality of subcarriers. Applicant submits that he has been unable to locate any teaching in Ebiko

directed to generating a replica of a transmitted symbol for each of a plurality of subcarriers as recited in claim 1. Ebiko discloses the receiver shown in figure 1. The channel estimation section 120 receives a received signal as an input from block 110 and an input from channel interleaver 170. The input from channel interleaver 170 is an interleaved space-time decoding result (paragraph 0021). The result of the decoder is a replica of the originally transmitted data symbol. Therefore, the channel estimation section 120 receives a replica of a transmitted symbol from the equalizer 130.

The rejections of the pending claims are stated below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-3 and 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sun et al (US 2005/0152314) in view of Andre (WO 01/37474) further in view of Ebiko et al (WO 03/071712). Ebiko et al (US 2004/0161058) is a translation of Ebiko et al (WO 03/071712) and is referenced in the rejection stated below.

Regarding claim 1, Sun discloses an averaging circuit adapted to provide an averaged channel estimate by performing a time domain averaging and a frequency domain averaging on one or more received inputs (paragraph 0154). An equalizer equalizes a received multicarrier symbol based on the averaged channel estimate. The

channel estimate H is used to calculate the equalization (paragraphs 0155-0160). Sun does not disclose a coarse channel estimator to receive a symbol replica and a received symbol to generate a coarse channel estimate. However, it is well known in the art of data communication that a received signal is equivalent to the transmitted signal and the distortion caused by the medium the transmitted signal travels through prior to being received. This fact is shown in figure 3a of Andre. The response H of a channel is equal to the received sequence divided by the known transmitted sequence in the frequency domain. This is further described in page 9, lines 11-21. The transfer function is the channel estimate. It would have been obvious for one of ordinary skill in the art at the time of the invention to combine the teachings of Andre into the apparatus of Sun to utilize the equation of H(f) = R(f)/T(f) to determine a transfer function (channel estimate). The channel estimate is important to determine in a receiver since the distortion cause by the channel will degrade the received signal and may prevent the proper recovery of the transmitted signal. The combination discloses a known sequence is used to determine the channel response. The known sequence will be stored in the receiver. The combination does not disclose the generation of a replica of the transmitted symbol. Ebiko discloses a received sequence is input to a channel estimation section 120 (figure 1). The channel estimation section receives a replica of the received signal from the equalizer 130 (abstract). The replica of the received signal is de-interleaved 140 and decoded 150 to recover the originally transmitted symbol. This symbol is fed to the channel estimation section 120 to determine the channel estimation. The channel estimation receives a received symbol and the replica of the originally transmitted

symbol. It would have been obvious for one of ordinary skill in the art at the time of the invention to include an adaptive equalizer in the apparatus. Instead of using a fixed replica symbol and being required to transmit a known sequence to determine the channel estimate, data is used to calculate the estimate. Therefore, the data rate of the system is increased allowing more data to be transmitted in less time than before.

Regarding claim 2, Sun discloses the averaging circuit is adapted to provide an averaged channel estimate by performing time domain averaging and frequency domain averaging on one or more received channel estimates (paragraph 0154).

Regarding claim 3, Sun further discloses the averaging circuit comprises a time domain averaging block adapted to perform time domain averaging on a plurality of received channel estimates to generate a time domain averaged channel estimate on a per subcarrier basis (paragraphs 0154 and 0156). A frequency domain averaging block is adapted to perform frequency domain averaging on a received time domain averaged channel estimate (paragraph 0154). The time domain averaging is taken prior to the FFT and the frequency domain averaging is done after the FFT.

Regarding claim 10, Sun discloses the multicarrier symbol comprises an OFDM symbol (paragraph 0110).

Regarding claims 11 and 13, Sun discloses an averaging circuit adapted to provide an averaged channel estimate by performing a time domain averaging and a frequency domain averaging on one or more received inputs (paragraph 0154). An equalizer equalizes a received multicarrier symbol based on the averaged channel estimate. The channel estimate H is used to calculate the equalization (paragraphs

0155-0160). Sun discloses the equalizer comprises an adaptive equalizer (paragraph 0156). Sun does not disclose a coarse channel estimator to receive a symbol replica and a received symbol to generate a coarse channel estimate. However, it is well known in the art of data communication that a received signal is equivalent to the transmitted signal and the distortion caused by the medium the transmitted signal travels through prior to being received. This fact is shown in figure 3a of Andre. The response H of a channel is equal to the received sequence divided by the known transmitted sequence in the frequency domain. This is further described in page 9, lines 11-21. The transfer function is the channel estimate. It would have been obvious for one of ordinary skill in the art at the time of the invention to combine the teachings of Andre into the apparatus of Sun to utilize the equation of $H(f) = R(f)/T(f)$ to determine a transfer function (channel estimate). The channel estimate is important to determine in a receiver since the distortion cause by the channel will degrade the received signal and may prevent the proper recovery of the transmitted signal. Andre transmits a known sequence to determine the effect of the channel on the received data. The channel can be compensated for and data will be properly recovered. The combination does not disclose the generation of a replica of the transmitted symbol. Ebiko discloses a received sequence is input to a channel estimation section 120 (figure 1). The channel estimation section receives a replica of the received signal from the equalizer 130 (abstract). The replica of the received signal is de-interleaved 140 and decoded 150 to recover the originally transmitted symbol. This symbol is fed to the channel estimation section 120 to determine the channel estimation. The channel estimation receives a

received symbol and the replica of the originally transmitted symbol. It would have been obvious for one of ordinary skill in the art at the time of the invention to include an adaptive equalizer in the apparatus. Instead of using a fixed replica symbol and being required to transmit a known sequence to determine the channel estimate, data is used to calculate the estimate. Therefore, the data rate of the system is increased allowing more data to be transmitted in less time than before.

Regarding claim 12, Sun discloses the averaging circuit is adapted to provide an averaged channel estimate by performing time domain averaging and frequency domain averaging on one or more received channel estimates (paragraph 0154).

Regarding claim 14, Sun discloses the multicarrier symbol comprises an OFDM symbol (paragraph 0110).

5. Claims 4, 15, 16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sun et al (US 2005/0152314) in view of Andre (WO 01/37474) further in view of Ebiko et al (WO 03/071712) further in view of Kim et al (US 2004/0125235).

Regarding claim 4, the combination of Sun, Andre and Ebiko discloses the apparatus stated above in paragraph 4. The combination does not disclose the frequency domain averaging block generates frequency domain averaged channel estimates that are used to update coefficients of the equalizer. Kim discloses using channel estimates to update coefficients of the equalizer (paragraph 0021) to reduce channel distortion (paragraph 0021). For this reason, it would have been obvious for

one of ordinary skill in the art at the time of the invention to combine the coefficient update of Kim into the apparatus of the combination of Sun, Andre and Ebiko.

Regarding claims 15 and 16, Sun discloses an averaging circuit adapted to provide an averaged channel estimate by performing a time domain averaging and a frequency domain averaging on one or more received inputs (paragraph 0154). An equalizer equalizes a received multicarrier symbol based on the averaged channel estimate. The channel estimate H is used to calculate the equalization (paragraphs 0155-0160). Sun does not disclose a coarse channel estimator to receive a symbol replica and a received symbol to generate a coarse channel estimate. However, it is well known in the art of data communication that a received signal is equivalent to the transmitted signal and the distortion caused by the medium the transmitted signal travels through prior to being received. This fact is shown in figure 3a of Andre. The response H of a channel is equal to the received sequence divided by the known transmitted sequence in the frequency domain. This is further described in page 9, lines 11-21. The transfer function is the channel estimate. It would have been obvious for one of ordinary skill in the art at the time of the invention to combine the teachings of Andre into the apparatus of Sun to utilize the equation of H(f) = R(f)/T(f) to determine a transfer function (channel estimate). The channel estimate is important to determine in a receiver since the distortion cause by the channel will degrade the received signal and may prevent the proper recovery of the transmitted signal. The combination discloses a known sequence is used to determine the channel response. The known sequence will be stored in the receiver. The combination does not disclose the generation of a replica

of the transmitted symbol. Ebiko discloses a received sequence is input to a channel estimation section 120 (figure 1). The channel estimation section receives a replica of the received signal from the equalizer 130 (abstract). The replica of the received signal is de-interleaved 140 and decoded 150 to recover the originally transmitted symbol. This symbol is fed to the channel estimation section 120 to determine the channel estimation. The channel estimation received a received symbol and the replica of the originally transmitted symbol. It would have been obvious for one of ordinary skill in the art at the time of the invention to include an adaptive equalizer in the apparatus. Instead of using a fixed replica symbol and being required to transmit a known sequence to determine the channel estimate, data is used to calculate the estimate. Therefore, the data rate of the system is increased allowing more data to be transmitted in less time than before. The combination of Sun, Andre and Ebiko does not disclose the frequency domain averaging block generates frequency domain averaged channel estimates that are used to update coefficients of the equalizer. Kim discloses using channel estimates to update coefficients of the equalizer (paragraph 0021) to reduce channel distortion (paragraph 0021). For this reason, it would have been obvious for one of ordinary skill in the art at the time of the invention to combine the coefficient update of Kim into the apparatus of the combination of Sun, Andre and Ebiko.

Regarding claim 18, Sun discloses an averaging circuit adapted to provide an averaged channel estimate by performing a time domain averaging and a frequency domain averaging on one or more received inputs (paragraph 0154). An equalizer equalizes a received multicarrier symbol based on the averaged channel estimate. The

channel estimate H is used to calculate the equalization (paragraphs 0155-0160). Sun does not disclose a coarse channel estimator to receive a symbol replica and a received symbol to generate a coarse channel estimate. However, it is well known in the art of data communication that a received signal is equivalent to the transmitted signal and the distortion caused by the medium the transmitted signal travels through prior to being received. This fact is shown in figure 3a of Andre. The response H of a channel is equal to the received sequence divided by the known transmitted sequence in the frequency domain. This is further described in page 9, lines 11-21. The transfer function is the channel estimate. It would have been obvious for one of ordinary skill in the art at the time of the invention to combine the teachings of Andre into the apparatus of Sun to utilize the equation of H(f) = R(f)/T(f) to determine a transfer function (channel estimate). The channel estimate is important to determine in a receiver since the distortion cause by the channel will degrade the received signal and may prevent the proper recovery of the transmitted signal. Andre transmits a known sequence to determine the effect of the channel on the received data. The channel can be compensated for and data will be properly recovered. The combination does not disclose the generation of a replica of the transmitted symbol. Ebiko discloses a received sequence is input to a channel estimation section 120 (figure 1). The channel estimation section receives a replica of the received signal from the equalizer 130 (abstract). The replica of the received signal is de-interleaved 140 and decoded 150 to recover the originally transmitted symbol. This symbol is fed to the channel estimation section 120 to determine the channel estimation. The channel estimation receives a received symbol and the replica of the

originally transmitted symbol. It would have been obvious for one of ordinary skill in the art at the time of the invention to include an adaptive equalizer in the apparatus. Instead of using a fixed replica symbol and being required to transmit a known sequence to determine the channel estimate, data is used to calculate the estimate. Therefore, the data rate of the system is increased allowing more data to be transmitted in less time than before. The combination of Sun, Andre and Ebiko does not disclose the frequency domain averaging block generates frequency domain averaged channel estimates that are used to update coefficients of the equalizer. Kim discloses using channel estimates to update coefficients of the equalizer (paragraph 0021) to reduce channel distortion (paragraph 0021). For this reason, it would have been obvious for one of ordinary skill in the art at the time of the invention to combine the coefficient update of Kim into the apparatus of the combination of Sun, Andre and Ebiko.

6. Claims 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sun et al (US 2005/0152314) in view of Andre (WO 01/37474) further in view of Ebiko et al (WO 03/071712) further in view of Papathanasion (US 2004/0142665).

Regarding claim 5, the combination of Sun, Andre and Ebiko discloses the apparatus stated above in paragraph 4. The combination does not disclose the time domain averaging is performed using a moving average. Papathanasion discloses averaging using a moving average in paragraph 0042. Moving averaging is well known in the art for its ability to maintain a constant average value. For this reason, it would have been obvious for one of ordinary skill in the art at the time of the invention to

combine the teaching of Papathanasion into the apparatus of the combination of Sun, Andre and Ebiko.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sun et al (US 2005/0152314) in view of Andre (WO 01/37474) further in view of Ebiko et al (WO 03/071712) further in view of Abeta et al (US 6,757,272).

Regarding claim 6, the combination of Sun, Andre and Ebiko discloses the apparatus stated above in paragraph 4. The combination does not disclose the time domain averaging is done by block averaging. Abeta discloses using block averaging (column 7, lines 57-67) since block averaging is computationally efficient since the average is not being constantly calculated. For this reason, it would have been obvious for one of ordinary skill in the art at the time of the invention to combine the block averaging of Abeta into the combination of Sun, Andre and Ebiko.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M. Burd whose telephone number is (571) 272-3008. The examiner can normally be reached on Monday - Friday 9 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David C. Payne can be reached on (571) 272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kevin M. Burd/
Primary Examiner, Art Unit 2611
6/24/2008